PATENT ABSTRACTS OF JAPAN

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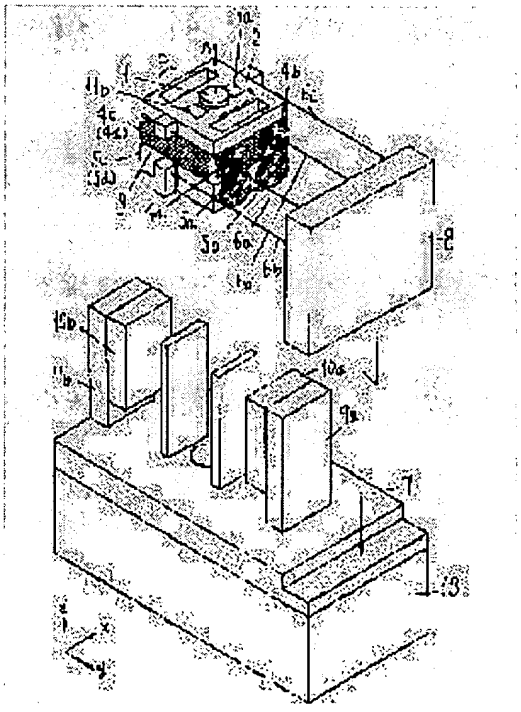
(54) OPTICAL DISK DEVICE

(57)Abstract:

PURPOSE: To compensate the tilt of the optical axis of a beam at high speed to the change of a quantity in one round of a disk by adjusting driving currents flowing through plural tilt coils and compensating the tilt inn the radial direction of a medium and the optical axis of an objective lens.

CONSTITUTION: Among the lights emerged from an objective lens 1 and converged on an optical disk, the diffracted light which does not return to the lens 1 is made incident on tilt detectors 11a, 11b. When a lens holder 2 is parallel to the optical disk, the light quantities received by the detectors 11a, 11b are equal to each other. When they are not in parallel with, the difference between the received light quantities of the detectors 11a, 11b is generated and a tilt detecting signal is generated. By causing currents to flow through tilt coils 5a, 5b based on the signal, the electromagnetic action is generated in a magnetic circuit composed of U-shaped yokes 9a, 9b and magnets 10a, 10b, an objective lens holder 2 holding the lens 1 is tilted in the radial direction C of the disk and the deviation between the optical disk and optical axis of the light beam is compensated.



LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] An inclination detection means to detect the include-angle gap with a shaft vertical to the optical axis of the light emitted on an information record medium at least from the objective lens which condenses light, and this objective lens, and the recording surface of said information record medium, The object lens holder holding said objective lens, and the supporting material which consists of two or more elastic bodies which enable actuation of this object lens holder in the direction of a focus and the direction of tracking, and the inclination direction of said optical axis, The pedestal which fixes this supporting material, and the focal coil which winds or fixes on the side face of said object lens holder, and drives said object lens holder in the direction of a focus, The tracking coil which fixes on the information record-medium hoop direction side face of said object lens holder, and drives said object lens holder in the direction of tracking, and the tilt coil driven in the tilting direction, The optical disk unit characterized by consisting of the permanent magnet and yoke which are arranged so that these coils may be countered, and form a magnetic circuit, adjusting the actuation current passed in two or more tilt coils based on the output of said inclination detection means, and amending the direction inclination of a path of the optical axis of the above-mentioned objective lens, and an information record medium.
[Claim 2] The optical disk unit according to claim 1 with which the tracking coil and the tilt coil have been arranged at juxtaposition on the same side face of the information record-medium hoop direction of an object lens holder.
[Claim 3] Claim 1 by which the tilt coil has been arranged at cross direction within the limits of the magnetic circuit which consists of a permanent magnet and a yoke, and an optical disk unit given in two.

[Claim 4] The optical disk unit according to claim 1 to 3 with which the tilt coil more than a couple has been arranged at the information record-medium hoop direction edge of the top face of an object lens holder, or an underside.
[Claim 5] The optical disk unit according to claim 1 to 3 which the focal coil more than the couple which can be respectively driven independently on the information record-medium hoop direction side face of an object lens holder is arranged, adjusts the current passed in said focal coil based on the output of said inclination detection means, and tilts said object lens holder to the direction of a focus, and the hoop direction of said information record medium.
[Claim 6] The optical disk unit according to claim 1 to 4 which possesses a focal coil, a tracking coil, and a tilt coil in the object lens holder which has a pore in the center and has an objective lens at the edge, and this pore.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention enables it to amend the inclination to the disk recording surface of a beam optical axis at a high speed about optical disk units, such as optical disk regenerative apparatus, such as CD (compact disc) player and LD (laser disc) player, or an optical disk record regenerative apparatus.
[0002]
[Description of the Prior Art] If the optical axis of a signal regeneration beam leans to the optical disk playback side in optical disk regenerative apparatus, such as a CD player and LD player, optical aberration will occur, a cross talk will increase and a regenerative signal will deteriorate. Moreover, when the optical axis of a signal record beam leans to the optical disk playback side in the optical disk record regenerative apparatus, degradation of a record signal may be produced and a pit formation mistake may be produced.
[0003] In the conventional LD player etc., the average amount of camber of a disk round was detected to the direction camber of a path of a disk, the whole optical pickup was leaned by tilt motors, such as a DC motor, and the tilt control unit which carries out beam optical-axis control was attached.
[0004] Moreover, as for the optical disk unit, high density record-ization is progressing in recent years. although it is necessary to use the high (namely, aperture -- large) objective lens of NA (numerical aperture) which raised resolution for high density record playback, if aperture of an objective lens is enlarged, the degree of the comatic aberration accompanying the inclination of the beam optical axis over an optical disk playback side will become large in proportion to the cube of NA, and change of the amount of camber under disk round will pose a very big problem.
[0005]
[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional configuration, the response had the trouble that it was bad and could not respond even to change of the amount of camber under disk round, for inclination control of the whole optical pickup by a DC motor etc.
[0006] This invention solves the above-mentioned conventional technical problem, and it aims at offering the optical disk unit which enabled it to amend the inclination to the disk recording surface of a beam optical axis at a high speed to change of the amount of camber under disk round.
[0007]
[Means for Solving the Problem] An inclination detection means to detect the inclination to the disk recording surface of the beam optical axis with which the optical disk unit of this invention is emitted from an objective lens in order to attain this object, The magnetic driving means which makes tiltable the object lens holder holding said objective lens, and the supporting material supported possible [tilting of this object lens holder] and said object lens holder, It has the configuration possessing the inclination control means which tilts an object lens holder based on the inclination error signal which comes out of said inclination detection means, and amends the inclination to the disk recording surface of a beam

optical axis at a high speed.
[0008]
[Function] Since this invention can amend the inclination to the disk recording surface of a beam optical axis at a high speed to change of the amount of camber under disk round by the above-mentioned configuration, it can make generating of comatic aberration small and can perform record playback of a high-definition signal.
[0009]
[Example] One example of this invention is explained below, referring to a drawing.
[0010] Drawing 1 - drawing 3 show one example of the direction inclination control of the diameter of this invention optical disk (the direction of C), drawing 1 is the perspective view of an optical disk unit, drawing 2 is an important section sectional view in case there is no beam optical-axis gap of an inclination detection means, and drawing 3 is an important section sectional view when a beam optical-axis gap of an inclination detection means arises.
[0011] The objective lens 1 of optical system has a perimeter fixed by the object lens holder 2, and is held. The focal coil 3 is wound around the side face of the object lens holder 2, in the hoop direction (direction of y) side face of said object lens holder 2, the part was put on the tracking coils 4a, 4b, 4c, and 4d and these tracking coils 4a, 4b, 4c, and 4d, and the tilt coils 5a, 5b, 5c, and 5d have countered and fixed. The four parallel straight-lines-like supporting material 6a, 6b, 6c, and 6d fixes an end on the side face of said object lens holder 2, the other end fixes to the supporting-material fixed part 8, and moving part is supported possible [migration and tilting in the direction A of a focus, the direction B of tracking, and the three directions of direction inclination C of a path].
[0012] This supporting-material fixed part 8 fixes to the pedestal 7 possessing the magnetic circuit which consists of magnets 10a and 10b which fixed to the U character mold yokes 9a and 9b and these yokes of a couple in the direction of y, and this pedestal 7 is attached in the upper part of the optical pickup body 13. The inclination detectors 11a and 11b as shown in drawing 2 are attached in the top-face x direction of said object lens holder 2, it is emitted from said objective lens 1, and the diffracted light which does not return to said objective lens 1 among the light condensed and reflected by the optical disk 12 can be received now.
[0013] Actuation of the optical disk unit of this invention is explained below. The diffracted light which does not return to said objective lens 1 among the light which was emitted from said objective lens 1 and condensed by the optical disk 14 shines upon said inclination detectors 11a and 11b. As shown in drawing 2 , when said object lens holder 2 and optical disk 12 are parallel, the quantity of light received with two inclination detectors 11a and 11b is equal. However, as shown in drawing 3 , when said object lens holder 2 and optical disk 12 are not parallel, a difference arises in the light income of said inclination detectors 11a and 11b, and an inclination detecting signal occurs. the magnetic circuit which consists of said U character mold yokes 9a and 9b and Magnets 10a and 10b by energizing a current in the tilt coils 5a and 5b based on this signal -- electromagnetism -- the object lens holder 2 which an operation occurs and holds an objective lens 1 amends gap of the inclination optical disk 12 and a light beam optical axis in the direction C of the diameter of a disk.
[0014] moreover -- if the object lens holder 2 performs suitable energization for the tracking coils 4a-4d -- electromagnetism -- a parallel displacement is carried out in the direction of tracking according to an operation. For this reason, the tracking of the light beam which irradiates an optical disk through an objective lens 1 can be adjusted. moreover -- if suitable energization for the focal coil 3 is performed -- electromagnetism -- the object lens holder 2 carries out a parallel displacement in the direction of a focus according to an operation. For this reason, the focus of the light beam which irradiates an optical disk through an objective lens 1 can be adjusted.
[0015] A high speed can be compensated for beam optical-axis gap of the light emitted from an objective lens 1 to the direction inclination change of a path under round of the rotating optical disk by driving the tilt coils 5a, 5b, 5c, and 5d based on the inclination error signal generated with the inclination detectors 11a and 11b in this example.
[0016] Moreover, since the intensive arrangement of the magnetic circuit can be carried out in a hoop

direction, an optical pickup can be miniaturized in the direction of a path, major-diameter-izing of a spindle motor and high torque-ization become easy, and low-power-ization of a device can be performed.

[0017] It explains referring to a drawing about the 2nd example of this invention below. Drawing 4 is the perspective view of the optical disk unit in which the 2nd example of this invention is shown. In drawing 4 , the same sign is appended to the configuration member which has the same function as drawing 1 . Differing from the configuration of drawing 1 is the point of having attached the square shape tracking coils 104a, 104b, 104c, and 104d and the square shape tilt coils 105a, 105b, 105c, and 105d on the object lens-holder hoop direction side face at juxtaposition.

[0018] In addition, since it is the same as that of the 1st example about actuation, it omits here. By arranging the square shape tracking coils 104a, 104b, 104c, and 104d and the square shape tilt coils 105a, 105b, 105c, and 105d to juxtaposition on an object lens-holder hoop direction side face as mentioned above, the gap of a magnetic circuit can be narrowed, since the flux density which passes various coils improves, actuation sensibility improves, and in addition to the effectiveness of an example 1, low-power-ization of a device can be performed.

[0019] It explains referring to a drawing about the 3rd example of this invention below. Drawing 5 is the important section side elevation of the optical disk unit in which the 3rd example of this invention is shown, and drawing 6 is the important section side elevation of a tilt coil. In drawing 5 - drawing 6 , the same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 . Differing from the configuration of drawing 1 - drawing 4 is a point arranged inside the cross direction of the effective field field of the magnetic circuit which consists of magnets 10a and 10b which fixed to the U character mold yokes 9a and 9b which do not illustrate the square shape tilt coils 105a, 105b, 105c, and 105d, and these yokes.

[0020] In addition, since it is the same as that of the 1st example about actuation, it omits here. By considering as the above-mentioned configuration, the square shape tilt coils 105a, 105b, and 105c, the cross talk driving force F1 with the 105 symmetricald of the directions of tracking, and F2, F3 and F4 occur, since each offsets each other and suits, only the tilt driving force Ftl acts, the stable servo property without a cross talk is acquired, and, in addition to the effectiveness of examples 1 and 2, improvement in a signal quality can be aimed at.

[0021] It explains referring to a drawing about the 4th example of this invention below. Drawing 7 is the perspective view of the optical disk unit in which the 4th example of this invention is shown. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 7 . Differing from the configuration of drawing 1 - drawing 4 is a point arranged so that the part may go into the effective field field of the magnetic circuit which consists of magnets 10a and 10b which fixed the square shape tilt coils 105a, 105b, 105c, and 105d to Yokes 109a and 109b and these yokes to the top-face edge of the object lens holder 102 with a stage.

[0022] In addition, since it is the same as that of the 1st example about actuation, it omits here. Since the square shape tilt coils 105a, 105b, 105c, and 105d can be arranged at a x-y flat surface and the object lens holder 102 with a stage can be made thin by considering as the above-mentioned configuration, in addition to the effectiveness of an example 1, thin shape-ization of a device can be performed.

[0023] It explains referring to a drawing about the 5th example of this invention below. Drawing 8 is the perspective view of the optical disk unit in which the 5th example of this invention is shown, and drawing 9 is the block diagram of an inclination control circuit. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 8 . Differing from the configuration of drawing 1 - drawing 4 is the point of arranging voice coils 103a and 103b so that it may become a pair in the hoop direction (the direction of y) of the object lens holder 2, and providing the hoop direction inclination detectors 11c and 11d also on the hoop direction top face of said object lens holder.

[0024] The hoop direction inclination control approach of the optical disk unit constituted as mentioned above is explained. Differential is taken with the preceding paragraph amplifier 51, the inclination signal detected by the hoop direction inclination detectors 11c and 11d is distributed to two, one side is

inputted into the addition actuation amplifier 52, and it adds with a focal control signal, and energizes to voice coil 103a. Moreover, another differential signal is inputted into the differential actuation amplifier 53, and it subtracts with a focal control signal, and energizes to voice coil 103b. the electromagnetism of voice coils 103a and 103b -- the object lens holder 2 which holds an objective lens 1 according to an operation is tilted to disk hoop direction inclination D while it adjusts FUOKASU of the light beam which irradiates an optical disk 12 through said objective lens 1, and it amends gap of an optical disk 12 and a light beam optical axis.

[0025] While arranging so that a focal coil and a tilt coil may be made to serve a double purpose with voice coils 103a and 103b as mentioned above and it may become a pair in the hoop direction (the direction of y) of the object lens holder 2 While it adds. [the focal control signal divided into two in the control circuit, and an inclination control signal] Focal control and hoop direction inclination control can be simultaneously performed by considering as the configuration which subtracts another side, and, in addition to the effectiveness of examples 1-3, a high speed can be compensated for beam optical-axis gap of the light emitted from an objective lens 1 also to inclination change of the hoop direction under round of the rotating optical disk.

[0026] It explains referring to a drawing about the 6th example of this invention below. Drawing 10 is the perspective view of the optical disk unit in which the 6th example of this invention is shown. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 10 . The edge object lens holder 202 which differing from the configuration of drawing 1 - drawing 4 possesses an objective lens 1 at the hoop direction edge, it possesses notching on the underside, and possesses a pore 202 in the center further, Arrange the focal coil 3 to said pore 302, and the tracking coils 104a and 104b are fixed on the side face by the side of said objective lens 1 of this focal coil 3. The tilt coils 105a and 105b are fixed on the top face of said focal coil 3. It is the point which arranges the magnetic circuit which consists of yokes 209a, 209b, and 209c which furthermore counter, and magnets 10a and 10b to the pedestal 7 so that some of said focal coils 3, tracking coils 104a and 104b, and tilt coils 105a and 105b may be inserted.

[0027] In addition, since it is the same as that of the 1st example about actuation, it omits here. Since the optical pickup body 13 can be arranged under the objective lens 1 of the edge object lens holder 102 and thin shape-ization of the whole optical pickup is attained by considering as the above-mentioned configuration, in addition to the effectiveness of an example 1, it increases also in the example 4, and thin shape-ization of a device can be performed.

[0028]

[Effect of the Invention] An inclination detection means to detect the inclination of the beam optical axis and optical disk recording surface to which this invention is emitted from an objective lens as mentioned above, By providing the magnetic driving means which makes an object lens holder tiltable [the supporting material whose actuation is enabled, and said object lens holder] in the inclination direction of said optical axis, and the inclination control means which tilts said object lens holder based on the output of said inclination detection means Since a beam optical axis can be amended at a high speed to the inclination change under disk round, the outstanding optical disk unit which can make generating of comatic aberration small and can perform record playback of a high-definition signal is realizable.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention enables it to amend the inclination to the disk recording surface of a beam optical axis at a high speed about optical disk units, such as optical disk regenerative apparatus, such as CD (compact disc) player and LD (laser disc) player, or an optical disk record regenerative apparatus.

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PRIOR ART

[Description of the Prior Art] If the optical axis of a signal regeneration beam leans to the optical disk playback side in optical disk regenerative apparatus, such as a CD player and LD player, optical aberration will occur, a cross talk will increase and a regenerative signal will deteriorate. Moreover, when the optical axis of a signal record beam leans to the optical disk playback side in the optical disk record regenerative apparatus, degradation of a record signal may be produced and a pit formation mistake may be produced.
[0003] In the conventional LD player etc., the average amount of camber of a disk round was detected to the direction camber of a path of a disk, the whole optical pickup was leaned by tilt motors, such as a DC motor, and the tilt control unit which carries out beam optical-axis control was attached.
[0004] Moreover, as for the optical disk unit, high density record-ization is progressing in recent years. although it is necessary to use the high (namely, aperture -- large) objective lens of NA (numerical aperture) which raised resolution for high density record playback, if aperture of an objective lens is enlarged, the degree of the comatic aberration accompanying the inclination of the beam optical axis over an optical disk playback side will become large in proportion to the cube of NA, and change of the amount of camber under disk round will pose a very big problem.

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[0003] In the conventional LD player etc., the average amount of camber of a disk round was detected to the direction camber of a path of a disk, the whole optical pickup was leaned by tilt motors, such as a DC motor, and the tilt control unit which carries out beam optical-axis control was attached.
[0004] Moreover, as for the optical disk unit, high density record-ization is progressing in recent years. although it is necessary to use the high (namely, aperture -- large) objective lens of NA (numerical aperture) which raised resolution for high density record playback, if aperture of an objective lens is enlarged, the degree of the comatic aberration accompanying the inclination of the beam optical axis over an optical disk playback side will become large in proportion to the cube of NA, and change of the amount of camber under disk round will pose a very big problem.

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EFFECT OF THE INVENTION

[Effect of the Invention] By this invention, an inclination detection means to detect the inclination of the beam optical axis and optical disk recording surface which are emitted from an objective lens, the magnetic driving means which makes an object lens holder tiltable [the supporting material whose actuation is enabled, and said object lens holder] in the inclination direction of said optical axis, and the inclination control means which tilts said object lens holder based on the output of said inclination detection means are provided as mentioned above. Therefore, since a beam optical axis can be amended at a high speed to the inclination change under disk round, the outstanding optical disk unit which can make generating of comatic aberration small and can perform record playback of a high-definition signal is realizable.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional configuration, the response had the trouble that it was bad and could not respond even to change of the amount of camber under disk round, for inclination control of the whole optical pickup by a DC motor etc.
[0006] This invention solves the above-mentioned conventional technical problem, and it aims at offering the optical disk unit which enabled it to amend the inclination to the disk recording surface of a beam optical axis at a high speed to change of the amount of camber under disk round.

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MEANS

[Means for Solving the Problem] An inclination detection means to detect the inclination to the disk recording surface of the beam optical axis with which the optical disk unit of this invention is emitted from an objective lens in order to attain this object, The magnetic driving means which makes tiltable the object lens holder holding said objective lens, and the supporting material supported possible [tilting of this object lens holder] and said object lens holder, It has the configuration possessing the inclination control means which tilts an object lens holder based on the inclination error signal which comes out of said inclination detection means, and amends the inclination to the disk recording surface of a beam optical axis at a high speed.

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OPERATION

[Function] Since this invention can amend the inclination to the disk recording surface of a beam optical axis at a high speed to change of the amount of camber under disk round by the above-mentioned configuration, it can make generating of comatic aberration small and can perform record playback of a high-definition signal.

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EXAMPLE

[Example] One example of this invention is explained below, referring to a drawing.
[0010] Drawing 1 - drawing 3 show one example of the direction inclination control of the diameter of this invention optical disk (the direction of C), drawing 1 is the perspective view of an optical disk unit, drawing 2 is an important section sectional view in case there is no beam optical-axis gap of an inclination detection means, and drawing 3 is an important section sectional view when a beam optical-axis gap of an inclination detection means arises.
[0011] The objective lens 1 of optical system has a perimeter fixed by the object lens holder 2, and is held. The focal coil 3 is wound around the side face of the object lens holder 2, in the hoop direction (direction of y) side face of said object lens holder 2, the part was put on the tracking coils 4a, 4b, 4c, and 4d and these tracking coils 4a, 4b, 4c, and 4d, and the tilt coils 5a, 5b, 5c, and 5d have countered and fixed. The four parallel straight-lines-like supporting material 6a, 6b, 6c, and 6d fixes an end on the side face of said object lens holder 2, the other end fixes to the supporting-material fixed part 8, and moving part is supported possible [migration and tilting in the direction A of a focus, the direction B of tracking, and the three directions of direction inclination C of a path].
[0012] This supporting-material fixed part 8 fixes to the pedestal 7 possessing the magnetic circuit which consists of magnets 10a and 10b which fixed to the U character mold yokes 9a and 9b and these yokes of a couple in the direction of y, and this pedestal 7 is attached in the upper part of the optical pickup body 13. The inclination detectors 11a and 11b as shown in drawing 2 are attached in the top-face x direction of said object lens holder 2, it is emitted from said objective lens 1, and the diffracted light which does not return to said objective lens 1 among the light condensed and reflected by the optical disk 12 can be received now.
[0013] Actuation of the optical disk unit of this invention is explained below. The diffracted light which does not return to said objective lens 1 among the light which was emitted from said objective lens 1 and condensed by the optical disk 14 shines upon said inclination detectors 11a and 11b. As shown in drawing 2 , when said object lens holder 2 and optical disk 12 are parallel, the quantity of light received with two inclination detectors 11a and 11b is equal. However, as shown in drawing 3 , when said object lens holder 2 and optical disk 12 are not parallel, a difference arises in the light income of said inclination detectors 11a and 11b, and an inclination detecting signal occurs. the magnetic circuit which consists of said U character mold yokes 9a and 9b and Magnets 10a and 10b by energizing a current in the tilt coils 5a and 5b based on this signal -- electromagnetism -- the object lens holder 2 which an operation occurs and holds an objective lens 1 amends gap of the inclination optical disk 12 and a light beam optical axis in the direction C of the diameter of a disk.
[0014] moreover -- if the object lens holder 2 performs suitable energization for the tracking coils 4a-4d -- electromagnetism -- a parallel displacement is carried out in the direction of tracking according to an operation. For this reason, the tracking of the light beam which irradiates an optical disk through an objective lens 1 can be adjusted. moreover -- if suitable energization for the focal coil 3 is performed -- electromagnetism -- the object lens holder 2 carries out a parallel displacement in the direction of a focus according to an operation. For this reason, the focus of the light beam which irradiates an optical

disk through an objective lens 1 can be adjusted.
[0015] A high speed can be compensated for beam optical-axis gap of the light emitted from an objective lens 1 to the direction inclination change of a path under round of the rotating optical disk by driving the tilt coils 5a, 5b, 5c, and 5d based on the inclination error signal generated with the inclination detectors 11a and 11b in this example.
[0016] Moreover, since the intensive arrangement of the magnetic circuit can be carried out in a hoop direction, an optical pickup can be miniaturized in the direction of a path, major-diameter-izing of a spindle motor and high torque-ization become easy, and low-power-ization of a device can be performed.
[0017] It explains referring to a drawing about the 2nd example of this invention below. Drawing 4 is the perspective view of the optical disk unit in which the 2nd example of this invention is shown. In drawing 4 , the same sign is appended to the configuration member which has the same function as drawing 1 . Differing from the configuration of drawing 1 is the point of having attached the square shape tracking coils 104a, 104b, 104c, and 104d and the square shape tilt coils 105a, 105b, 105c, and 105d on the object lens-holder hoop direction side face at juxtaposition.
[0018] In addition, since it is the same as that of the 1st example about actuation, it omits here. By arranging the square shape tracking coils 104a, 104b, 104c, and 104d and the square shape tilt coils 105a, 105b, 105c, and 105d to juxtaposition on an object lens-holder hoop direction side face as mentioned above, the gap of a magnetic circuit can be narrowed, since the flux density which passes various coils improves, actuation sensibility improves, and in addition to the effectiveness of an example 1, low-power-ization of a device can be performed.
[0019] It explains referring to a drawing about the 3rd example of this invention below. Drawing 5 is the important section side elevation of the optical disk unit in which the 3rd example of this invention is shown, and drawing 6 is the important section side elevation of a tilt coil. In drawing 5 - drawing 6 , the same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 . Differing from the configuration of drawing 1 - drawing 4 is a point arranged inside the cross direction of the effective field field of the magnetic circuit which consists of magnets 10a and 10b which fixed to the U character mold yokes 9a and 9b which do not illustrate the square shape tilt coils 105a, 105b, 105c, and 105d, and these yokes.
[0020] In addition, since it is the same as that of the 1st example about actuation, it omits here. By considering as the above-mentioned configuration, the square shape tilt coils 105a, 105b, and 105c, the cross talk driving force F1 with the 105 symmetricald of the directions of tracking, and F2, F3 and F4 occur, since each offsets each other and suits, only the tilt driving force Ftl acts, the stable servo property without a cross talk is acquired, and, in addition to the effectiveness of examples 1 and 2, improvement in a signal quality can be aimed at.
[0021] It explains referring to a drawing about the 4th example of this invention below. Drawing 7 is the perspective view of the optical disk unit in which the 4th example of this invention is shown. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 7 . Differing from the configuration of drawing 1 - drawing 4 is a point arranged so that the part may go into the effective field field of the magnetic circuit which consists of magnets 10a and 10b which fixed the square shape tilt coils 105a, 105b, 105c, and 105d to Yokes 109a and 109b and these yokes to the top-face edge of the object lens holder 102 with a stage.
[0022] In addition, since it is the same as that of the 1st example about actuation, it omits here. Since the square shape tilt coils 105a, 105b, 105c, and 105d can be arranged at a x-y flat surface and the object lens holder 102 with a stage can be made thin by considering as the above-mentioned configuration, in addition to the effectiveness of an example 1, thin shape-ization of a device can be performed.
[0023] It explains referring to a drawing about the 5th example of this invention below. Drawing 8 is the perspective view of the optical disk unit in which the 5th example of this invention is shown, and drawing 9 is the block diagram of an inclination control circuit. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 8 . Differing from the configuration of drawing 1 - drawing 4 is the point of arranging voice coils 103a and 103b so

that it may become a pair in the hoop direction (the direction of y) of the object lens holder 2, and providing the hoop direction inclination detectors 11c and 11d also on the hoop direction top face of said object lens holder.

[0024] The hoop direction inclination control approach of the optical disk unit constituted as mentioned above is explained. Differential is taken with the preceding paragraph amplifier 51, the inclination signal detected by the hoop direction inclination detectors 11c and 11d is distributed to two, one side is inputted into the addition actuation amplifier 52, and it adds with a focal control signal, and energizes to voice coil 103a. Moreover, another differential signal is inputted into the differential actuation amplifier 53, and it subtracts with a focal control signal, and energizes to voice coil 103b. the electromagnetism of voice coils 103a and 103b -- the object lens holder 2 which holds an objective lens 1 according to an operation is tilted to disk hoop direction inclination D while it adjusts FUOKASU of the light beam which irradiates an optical disk 12 through said objective lens 1, and it amends gap of an optical disk 12 and a light beam optical axis.

[0025] While arranging so that a focal coil and a tilt coil may be made to serve a double purpose with voice coils 103a and 103b as mentioned above and it may become a pair in the hoop direction (the direction of y) of the object lens holder 2 While it adds. [the focal control signal divided into two in the control circuit, and an inclination control signal] Focal control and hoop direction inclination control can be simultaneously performed by considering as the configuration which subtracts another side, and, in addition to the effectiveness of examples 1-3, a high speed can be compensated for beam optical-axis gap of the light emitted from an objective lens 1 also to inclination change of the hoop direction under round of the rotating optical disk.

[0026] It explains referring to a drawing about the 6th example of this invention below. Drawing 10 is the perspective view of the optical disk unit in which the 6th example of this invention is shown. The same sign is appended to the configuration member which has the same function as drawing 1 - drawing 4 in drawing 10 . The edge object lens holder 202 which differing from the configuration of drawing 1 - drawing 4 possesses an objective lens 1 at the hoop direction edge, it possesses notching on the underside, and possesses a pore 202 in the center further, Arrange the focal coil 3 to said pore 302, and the tracking coils 104a and 104b are fixed on the side face by the side of said objective lens 1 of this focal coil 3. The tilt coils 105a and 105b are fixed on the top face of said focal coil 3. It is the point which arranges the magnetic circuit which consists of yokes 209a, 209b, and 209c which furthermore counter, and magnets 10a and 10b to the pedestal 7 so that some of said focal coils 3, tracking coils 104a and 104b, and tilt coils 105a and 105b may be inserted.

[0027] In addition, since it is the same as that of the 1st example about actuation, it omits here. Since the optical pickup body 13 can be arranged under the objective lens 1 of the edge object lens holder 102 and thin shape-ization of the whole optical pickup is attained by considering as the above-mentioned configuration, in addition to the effectiveness of an example 1, it increases also in the example 4, and thin shape-ization of a device can be performed.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective view of the optical disk unit in one example of this invention
[Drawing 2] An important section sectional view in case there is no beam optical-axis gap of the inclination detection means of the optical disk unit in one example of this invention
[Drawing 3] An important section sectional view when a beam optical-axis gap of the inclination detection means of the optical disk unit in one example of this invention arises
[Drawing 4] The perspective view of the optical disk unit in the 2nd example of this invention
[Drawing 5] The important section side elevation of the optical disk unit in the 3rd example of this invention
[Drawing 6] The important section side elevation of the tilt coil of the optical disk unit in the 3rd example of this invention
[Drawing 7] The perspective view of the optical disk unit in the 4th example of this invention
[Drawing 8] The perspective view of the optical disk unit in the 5th example of this invention
[Drawing 9] The block diagram of the inclination control circuit of the optical disk unit in the 5th example of this invention
[Drawing 10] The perspective view of the optical disk unit in the 6th example of this invention
[Description of Notations]
1 Objective Lens
2 Object Lens Holder
3 Focal Coil
4a-4d Tracking coil
5a-5d Tilt coil
6a-6d Supporting material
7 Pedestal
8 Supporting-Material Fixed Part
9a, 9b U character mold yoke
10a, 10b Magnet
11a-11d Inclination detector
12 Optical Disk
13 Optical Pickup Body
51 Preceding Paragraph Amplifier
52 Addition Actuation Amplifier
53 Differential Actuation Amplifier
102 Object Lens Holder with Stage
103a, 103b Voice coil
104a-104d Square shape tracking coil
105a-105d Square shape tilt coil
109a, 109b Yoke

202 Edge Object Lens Holder
209 a-c Thin yoke
302 Pore
A The direction of a focus
B The direction of tracking
C The direction inclination of a path
D Hoop direction inclination
S Optical principal point
Ftl Tilt driving force
F1-F4 Cross talk driving force
I Actuation current

[Translation done.]

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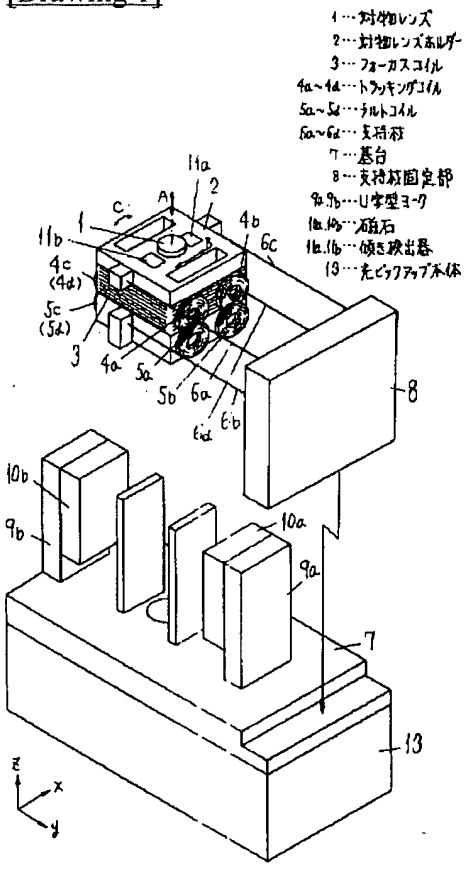
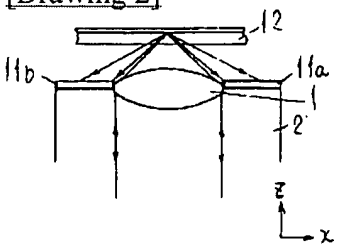
DRAWINGS

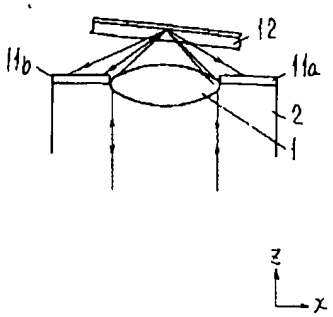
[Drawing 1]



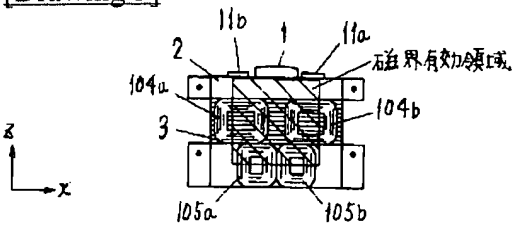
[Drawing 2]



[Drawing 3]



[Drawing 5]



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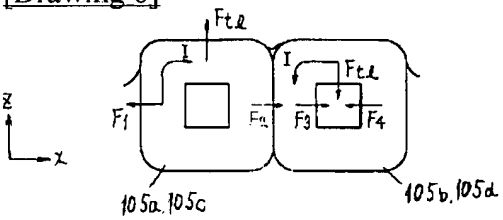

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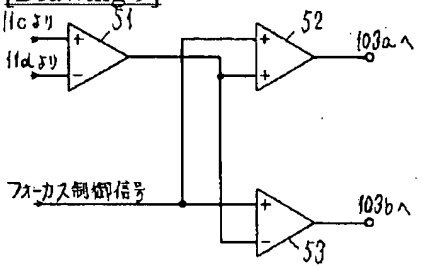
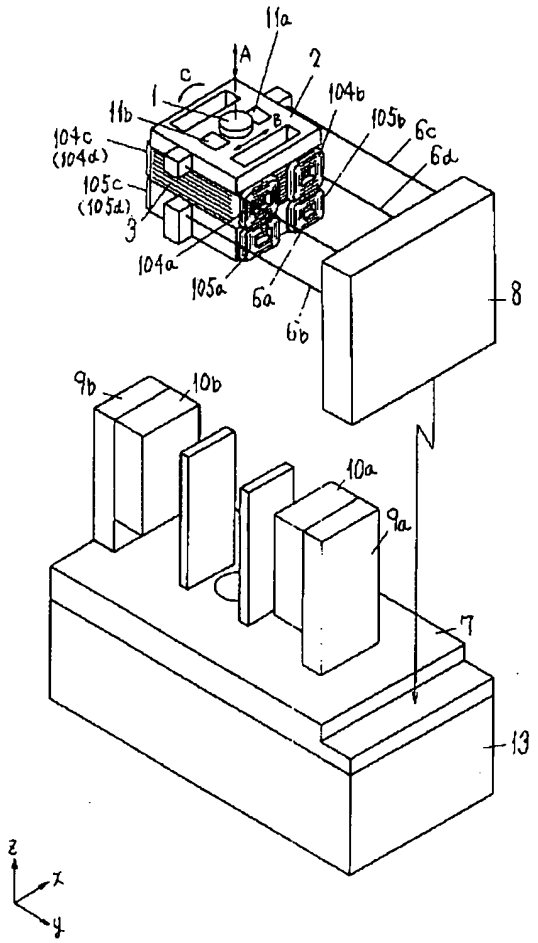
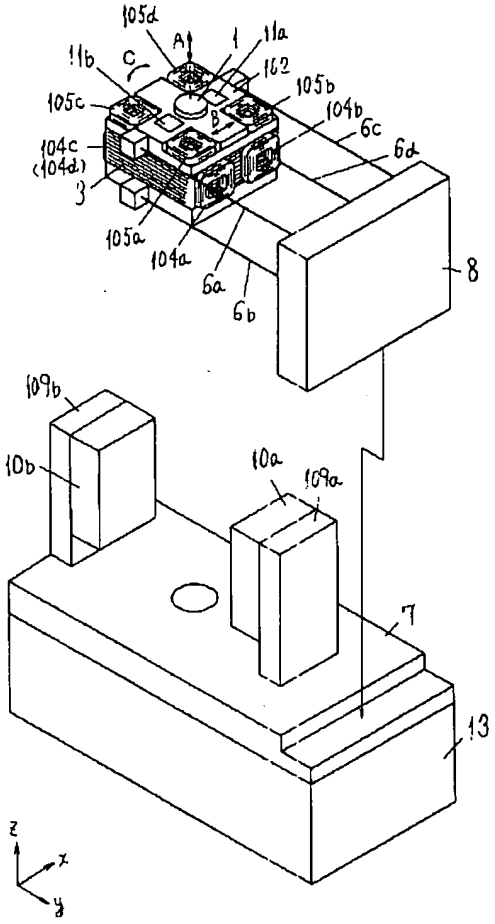


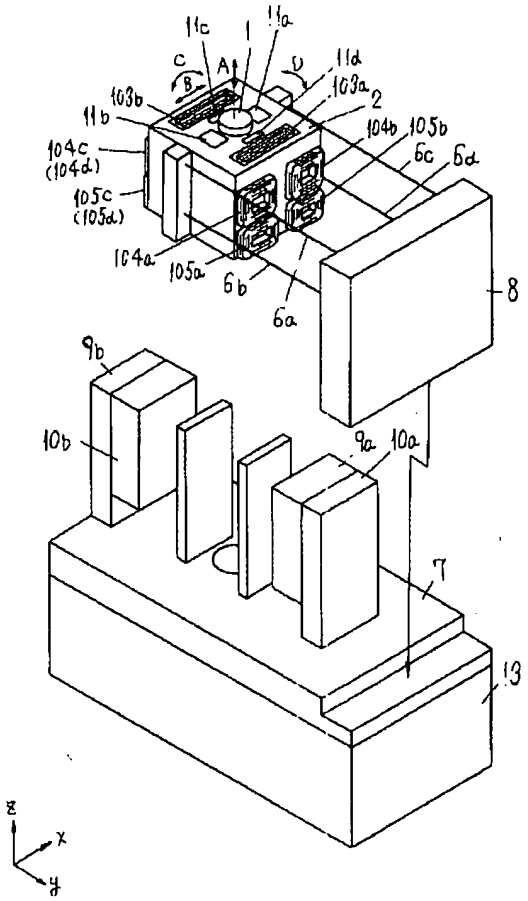
[Drawing 4]


11a
A
C
2
1
104b
11b
B
105b
6c
104c
(104d)
6d
105c
(105d)
3
104a
105a
6a
6b
8
9b
10b
10a
9a
7
13
z
x
y

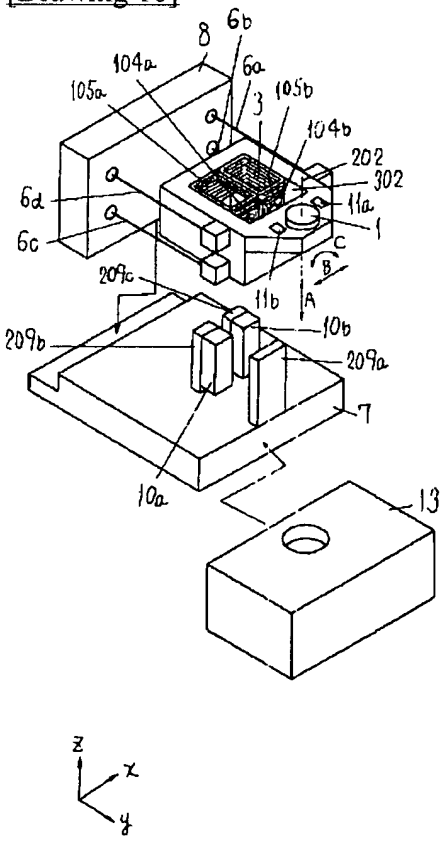
[Drawing 7]


105d
A
1
11a
11b
C
102
105b
105c
B
104b
6c
6d
104c
(104d)
3
105a
104a
6a
6b
8
109b
10b
10a
109a
7
13
z
x
y

[Drawing 8]


11c
1
11a
C
A
B
D
11d
103b
103a
2
11b
104b
105b
104c
(104d)
6c
6d
105c
(105d)
104a
105a
6b
6a
8
9b
10b
9a
10a
7
13
z
x
y

[Drawing 10]


8
6b
104a
6a
105a
3
105b
104b
202
302
6d
11a
1
6c
C
B
209c
11b
A
209b
10b
209a
7
10a
13
z
x
y

[Translation done.]